

Ch 9 Notes C.ink

Ch 9 Stoichiometry

Ch 9 Stoichiometry
↳ mass Relationships in chemical Rxns

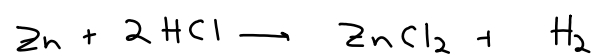
Ch 9 Stoichiometry
↳ mass Relationships in chemical Rxns

Molar Ratio

Ch 9 Stoichiometry

↳ mass Relationships in chemical Rxns

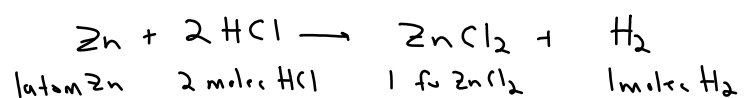
Molar Ratio



Ch 9 Stoichiometry

↳ mass Relationships in chemical Rxns

Molar Ratio



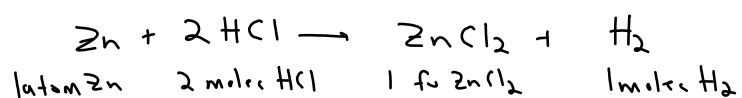
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Ch 9 Stoichiometry

↳ mass Relationships in chemical Rxns

Molar Ratio

coeff's
tell us #'s
of moles, f's, atoms
Reacting



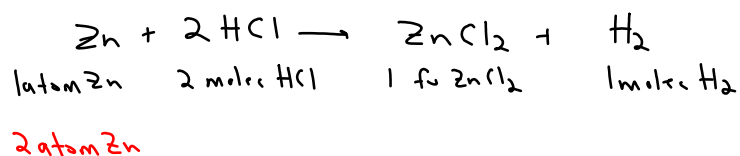
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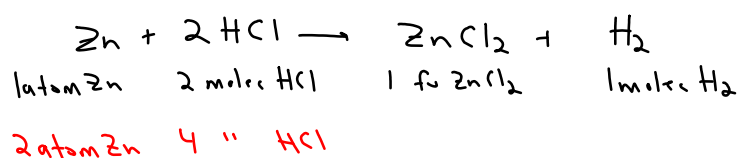
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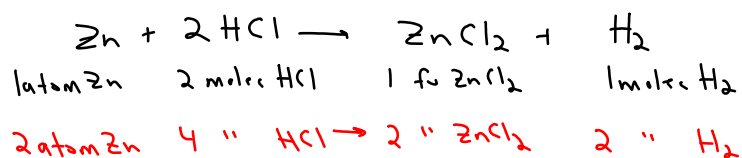
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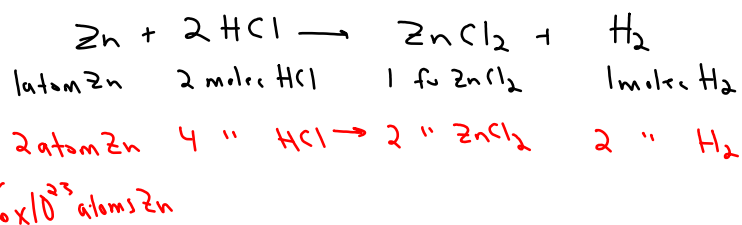
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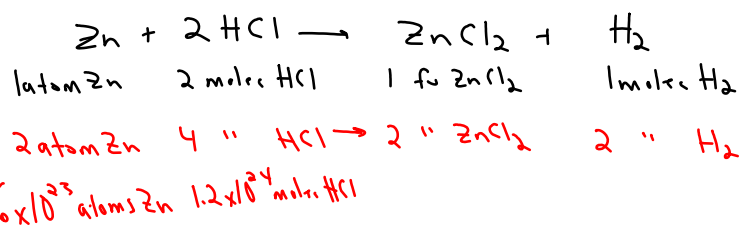
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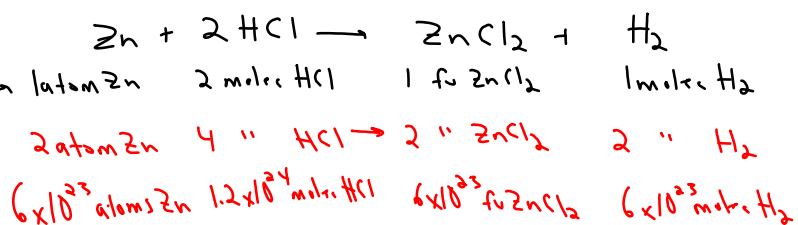
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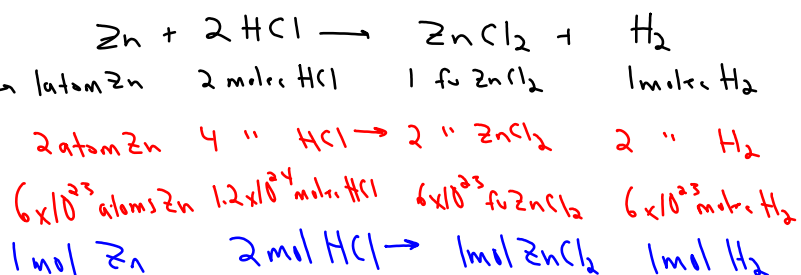
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Ch 9 Stoichiometry

↳ mass Relationships in chemical Rxns

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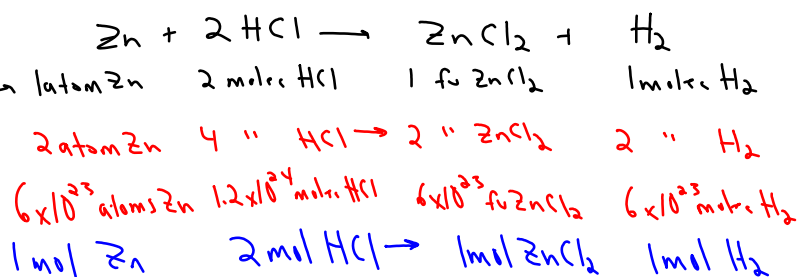
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Ch 9 Stoichiometry

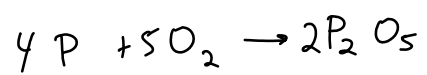
↳ mass Relationships in chemical Rxns

Molar Ratio

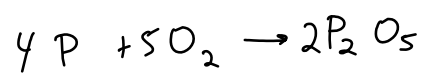
Coeff's
tell us #'s
of moles, g, atoms
Reacting



★ Coefficients mean #'s of moles !!!



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Molar Ratios
what is molar Ratio of:

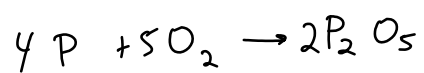
P to O_2

O_2 to P_2O_5

P to P_2O_5

Inverses?

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Molar Ratios
What is molar Ratio of:

P to O_2

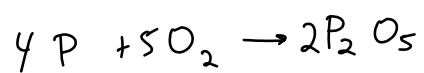
4mol P : 5mol O_2

O_2 to P_2O_5

P to P_2O_5

Inverses?

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Molar Ratios
what is molar Ratio of:

P to O_2

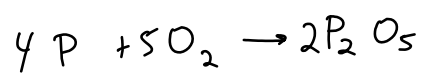
~~4 mol P : 5 mol O_2~~

O_2 to P_2O_5

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Inverses?

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Molar Ratios
what is molar Ratio of:

P to O_2

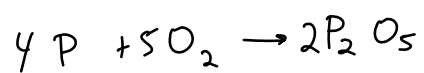
$$\frac{4\text{mol P} \cdot 5\text{mol O}_2}{5\text{mol O}_2} = \frac{4\text{mol P}}{5\text{mol O}_2}$$

O_2 to P_2O_5

P to P_2O_5

Inverses?

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Molar Ratios
what is molar Ratio of:

P to O_2

$$\frac{4\text{mol P} \cdot 5\text{mol O}_2}{5\text{mol O}_2} = \frac{4\text{mol P}}{5\text{mol O}_2}$$

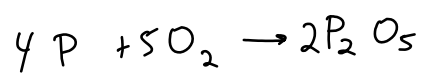
O_2 to P_2O_5

$$\frac{5\text{mol O}_2}{2\text{mol P}_2\text{O}_5}$$

P to P_2O_5

Inverses?

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Molar Ratios
What is molar Ratio of:

P to O_2

$$\frac{\cancel{4\text{mol P}} \cdot \cancel{5\text{mol O}_2}}{\cancel{5\text{mol O}_2}} \frac{4\text{mol P}}{5\text{mol O}_2}$$

O_2 to P_2O_5

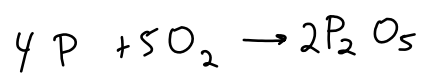
$$\frac{5\text{mol O}_2}{2\text{mol P}_2\text{O}_5}$$

P to P_2O_5

$$\frac{4\text{mol P}}{2\text{mol P}_2\text{O}_5}$$

Inverses?

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Molar Ratios
what is molar Ratio of:

P to O_2

$$\frac{\cancel{4\text{mol P}} \cdot \cancel{5\text{mol O}_2}}{\cancel{5\text{mol O}_2}} \frac{4\text{mol P}}{5\text{mol O}_2}$$

O_2 to P_2O_5

$$\frac{5\text{mol O}_2}{2\text{mol P}_2\text{O}_5}$$

P to P_2O_5

$$\frac{2\text{mol P}}{1\text{mol P}_2\text{O}_5}$$

Invert it?

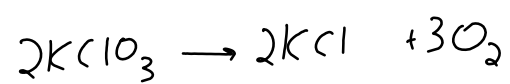
$$\frac{5\text{mol O}_2}{4\text{mol P}} \cdot \frac{2\text{mol P}_2\text{O}_5}{5\text{mol O}_2}$$

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mol-mol stoichiometry

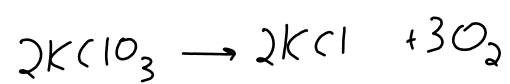
Ch 9 Notes C.ink

mol-mol stoichiometry



Ch 9 Notes C.ink

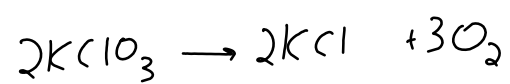
mol-mol stoichiometry



What is the molar
Ratio of KClO_3
to Oxygen?

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mol-mol stoichiometry

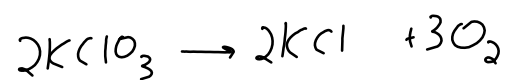


What is the molar
Ratio of KClO_3
to Oxygen?

$$\frac{2 \text{ mol KClO}_3}{3 \text{ mol O}_2}$$

Ch 9 Notes C.ink

mol-mol stoichiometry



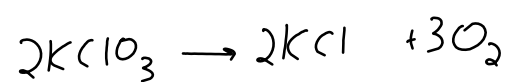
What is the molar
Ratio of KClO_3
to Oxygen?

$$\frac{2 \text{ mol KClO}_3}{3 \text{ mol O}_2}$$

★ Molar Ratio can be
Used as conversion Factor!

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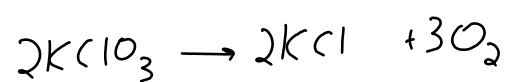
mol-mol stoichiometry



If 4.0 mol of KClO_3
decompose, How many
moles of Oxygen can
Be produced?

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mol-mol stoichiometry

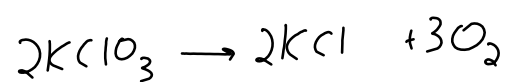


If 4.0 mol of KClO_3
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Be produced?

4.0 mol KClO_3

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mol-mol stoichiometry

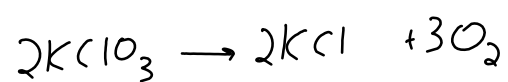


If 4.0 mol of KClO_3
decompose, how many
moles of oxygen can
be produced?

$$4.0 \text{ mol KClO}_3 \times \frac{\quad}{\text{mol KClO}_3}$$

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mol-mol stoichiometry

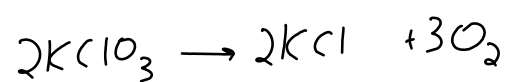


If 4.0 mol of KClO_3
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moles of oxygen can
be produced?

$$4.0 \text{ mol KClO}_3 \times \frac{\text{mol O}_2}{\text{mol KClO}_3}$$

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mol-mol stoichiometry

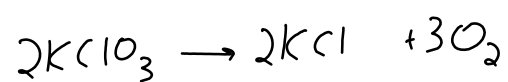


If 4.0 mol of KClO_3
decompose, how many
moles of oxygen can
be produced?

$$4.0 \text{ mol KClO}_3 \times \frac{3 \text{ mol O}_2}{2 \text{ mol KClO}_3}$$

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mol-mol stoichiometry

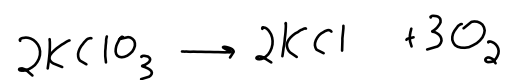


If 4.0 mol of KClO_3
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$$4.0 \cancel{\text{mol KClO}_3} \times \frac{3 \text{ mol O}_2}{2 \cancel{\text{mol KClO}_3}} =$$

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mol-mol stoichiometry

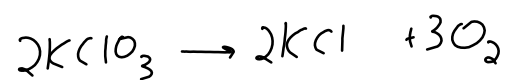


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$$4.0 \cancel{\text{mol KClO}_3} \times \frac{3 \text{ mol O}_2}{2 \cancel{\text{mol KClO}_3}} = \boxed{6.0 \text{ mol O}_2}$$

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mol-mol stoichiometry



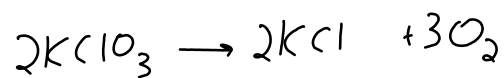
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Molar Ratio used as
conversion!

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mol-mol stoichiometry



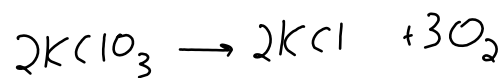
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If 3.92 mol O_2 are produced,
How many mol of KCl were
produced?

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mol-mol stoichiometry



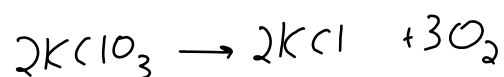
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If 3.92 mol O_2 are produced, 3.92 mol O_2
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mol-mol stoichiometry



If 4.0 mol of KClO_3
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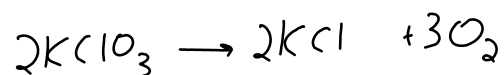
$$4.0 \cancel{\text{mol KClO}_3} \times \frac{3 \text{ mol O}_2}{2 \cancel{\text{mol KClO}_3}} = \boxed{6.0 \text{ mol O}_2}$$

If 3.92 mol O_2 are produced,
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produced?

$$3.92 \text{ mol O}_2 \times \frac{2 \text{ mol KCl}}{3 \text{ mol O}_2} =$$

Ch 9 Notes C.ink

mol-mol stoichiometry

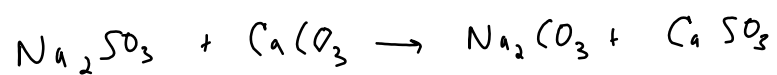


If 4.0 mol of KClO_3
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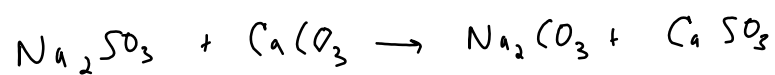
If 3.92 mol O_2 are produced,
How many mol of KCl were
produced?

$$3.92 \cancel{\text{mol O}_2} \times \frac{2 \text{ mol KCl}}{3 \cancel{\text{mol O}_2}} = \boxed{2.64 \text{ mol KCl}}$$



If 2.73 mol Na_2SO_3

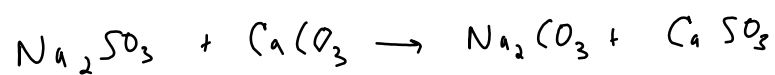
React, How many
mol of CaCO_3 are also
needed in the rxn?



If 2.73 mol Na_2SO_3

React, How many
mol of $\text{Ca}(\text{O}_3)$ are also
needed in the Rxn?

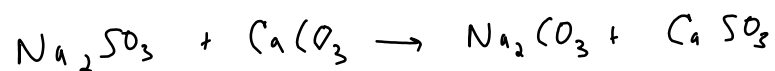
$$2.73 \text{ mol Na}_2\text{SO}_3 \times \frac{1 \text{ mol Ca}(\text{O}_3)}{1 \text{ mol Na}_2\text{SO}_3} = 2.73 \text{ mol Ca}(\text{O}_3)$$



If 2.73 mol Na_2SO_3

React, How many
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needed in the rxn?

$$2.73 \text{ mol Na}_2\text{SO}_3 \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol Na}_2\text{SO}_3} = 2.73 \text{ mol CaCO}_3$$



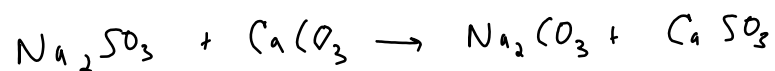
If 2.73 mol Na_2SO_3

React, How many

g of CaCO_3 are also
needed in the rxn?

$$2.73 \text{ mol Na}_2\text{SO}_3 \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol Na}_2\text{SO}_3} = 2.73 \text{ mol CaCO}_3$$

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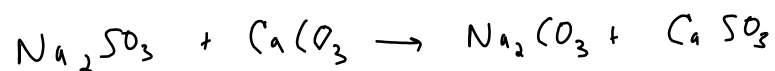
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$$2.73 \text{ mol Na}_2\text{SO}_3 \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol Na}_2\text{SO}_3} = 2.73 \text{ mol CaCO}_3$$

$$2.73 \text{ mol CaCO}_3 \times \frac{\text{g CaCO}_3}{\text{mol CaCO}_3}$$



If 2.73 mol Na_2SO_3

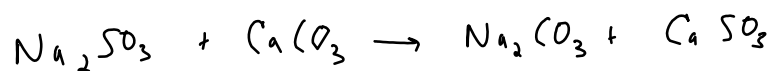
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$$2.73 \text{ mol CaCO}_3 \times \frac{100 \text{ g CaCO}_3}{1 \text{ mol CaCO}_3}$$

Ch 9 Notes C.ink



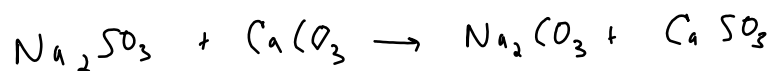
If 2.73 mol Na_2SO_3

React, How many

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$$2.73 \text{ mol Na}_2\text{SO}_3 \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol Na}_2\text{SO}_3} = 2.73 \text{ mol CaCO}_3$$

$$2.73 \text{ mol CaCO}_3 \times \frac{100 \text{ g CaCO}_3}{1 \text{ mol CaCO}_3} = 273 \text{ g CaCO}_3$$



If 2.73 mol Na_2SO_3

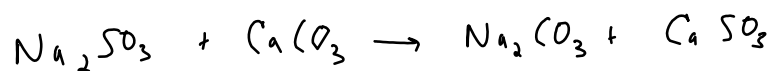
React, How many

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mol - mass stoichiometry

$$2.73 \text{ mol Na}_2\text{SO}_3 \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol Na}_2\text{SO}_3} = 2.73 \text{ mol CaCO}_3$$

$$2.73 \text{ mol CaCO}_3 \times \frac{100 \text{ g CaCO}_3}{1 \text{ mol CaCO}_3} = 273 \text{ g CaCO}_3$$



If 2.73 mol Na_2SO_3

React, How many

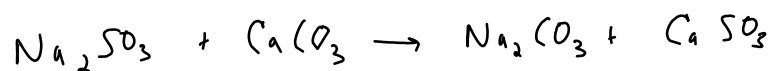
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$$\begin{array}{ccc} \text{mol A} & \xrightarrow[\text{Ratio}]{\text{Molar}} & \text{mol B} \\ \text{(given)} & & \text{(asked for)} \end{array}$$



If 2.73 mol Na_2SO_3
React, How many
g of CaCO_3 are also
need in the Rxn?

mol - mass stoichiometry

$$2.73 \text{ mol Na}_2\text{SO}_3 \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol Na}_2\text{SO}_3} = 2.73 \text{ mol CaCO}_3$$

$$2.73 \text{ mol CaCO}_3 \times \frac{100 \text{ g CaCO}_3}{1 \text{ mol CaCO}_3} = 273 \text{ g CaCO}_3$$

$$\text{mol A} \xrightarrow[\text{Ratio}]{\text{Molar}} \text{mol B} \xrightarrow[\frac{1 \text{ mol B}}{\text{g B}}]{\times \text{g B}} \text{g B}$$

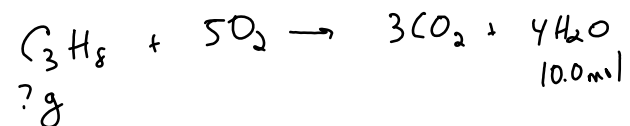
(given) (asked for)

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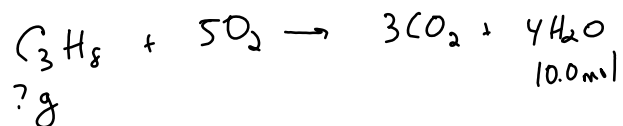
If 10.0 mol of H_2O are produced in the rxn above, how many g of C_3H_8 were combusted?

Ch 9 Notes C.ink



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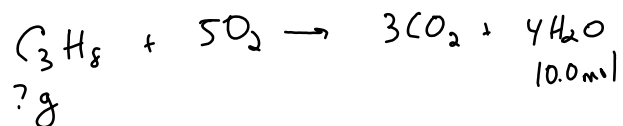
Ch 9 Notes C.ink



If 10.0ml of H_2O are produced in the rxn above, how many g of C_3H_8 were combusted?

$$10.0\text{ml H}_2\text{O} \times \frac{1\text{mol C}_3\text{H}_8}{4\text{mol H}_2\text{O}}$$

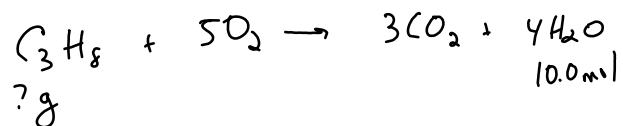
Ch 9 Notes C.ink



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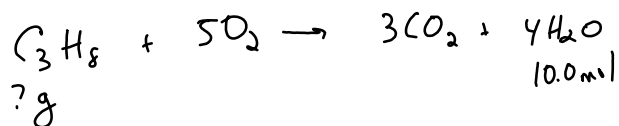
Ch 9 Notes C.ink



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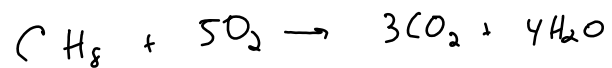
$$10.0\text{ml } \cancel{\text{H}_2\text{O}} \times \frac{1\text{mol } \text{C}_3\text{H}_8}{4\text{mol } \cancel{\text{H}_2\text{O}}} \times \frac{44\text{ g } \text{C}_3\text{H}_8}{1\text{mol } \text{C}_3\text{H}_8} =$$

Ch 9 Notes C.ink

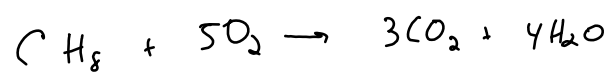


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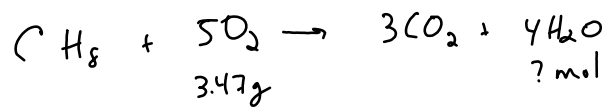


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mass to mol stoich

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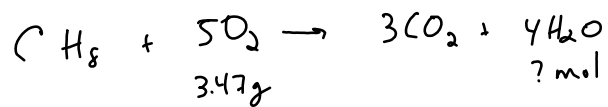


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Ch 9 Notes C.ink



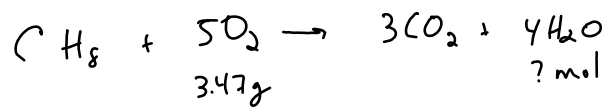
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If 3.47 g O_2 React,

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$$3.47 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32 \text{ g O}_2}$$

Ch 9 Notes C.ink



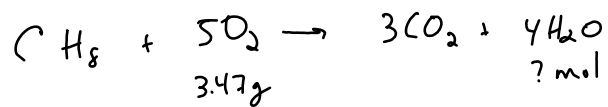
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Step 1: convert gA to
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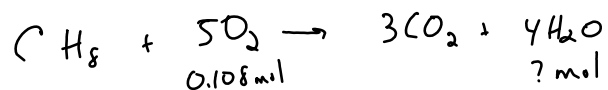
mass to mol stoich

If 3.47 g O_2 React,

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$$3.47 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32 \text{ g O}_2} = 0.108 \text{ mol O}_2$$

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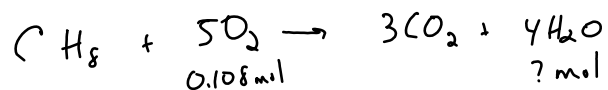
mass to mol stoich

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$$3.47 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32 \text{ g O}_2} = 0.108 \text{ mol O}_2 \times \frac{4 \text{ mol H}_2\text{O}}{5 \text{ mol O}_2} =$$

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mass to mol stoich

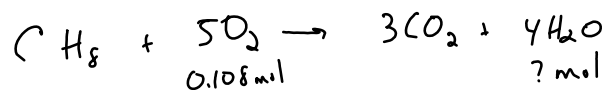
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Ch 9 Notes C.ink



mass to mol stoich

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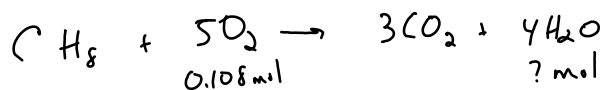
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Step 1: convert gA to
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Step 2: use molar
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Ch 9 Notes C.ink



mass to mol stoich

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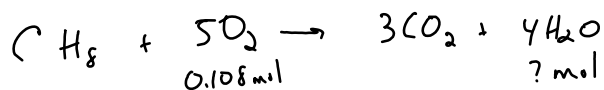
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$$\text{gA} \xrightarrow{\times \frac{1 \text{ mol A}}{\text{gA}}} \text{molA}$$

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If 3.47 g O_2 React,

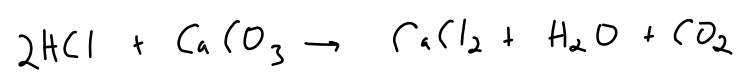
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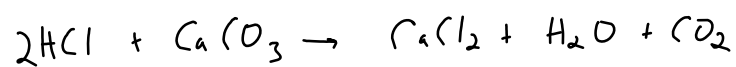
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$$\text{gA} \xrightarrow{\times \frac{1 \text{ mol A}}{\text{gA}}} \text{molA} \xrightarrow{\frac{\text{molar Ratio}}{\text{Ratio}}} \text{molB}$$



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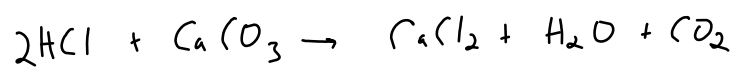


mass-mass stoich

If 4.78 g of HCl

React w/ CaCO_3 ,
what mass of CO_2 is
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Ch 9 Notes C.ink

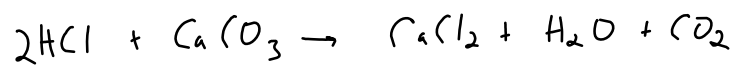


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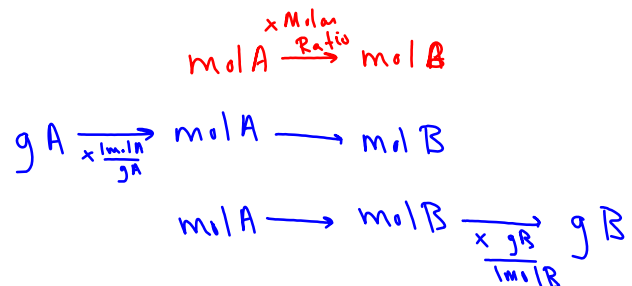
$\text{mol A} \xrightarrow[\text{Ratio}]{\times \text{Molar}} \text{mol B}$

Ch 9 Notes C.ink

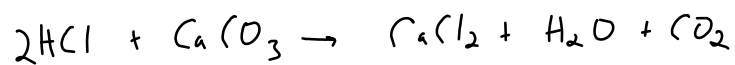


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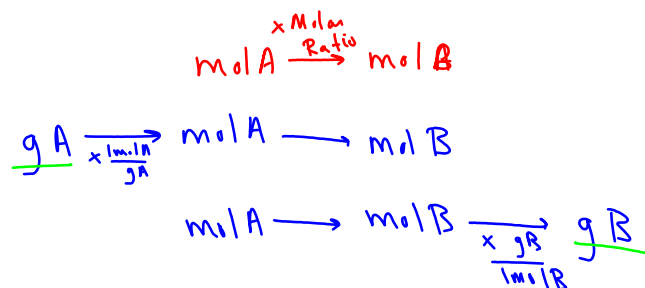


Ch 9 Notes C.ink

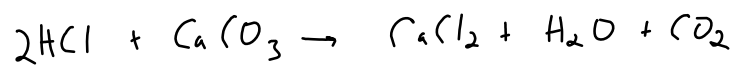


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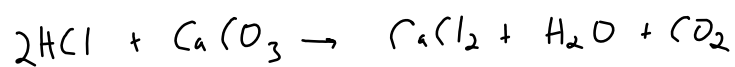
$\text{mol A} \xrightarrow[\text{Ratio}]{\times \text{Molar}} \text{mol B}$

g A $\xrightarrow{\times \frac{1 \text{ mol A}}{\text{g A}}}$ mol A \rightarrow mol B

mol A \rightarrow mol B $\xrightarrow[\frac{1 \text{ mol B}}{\text{g B}}]{\times \text{g B}}$ g B

g A \rightarrow mol A \rightarrow mol B \rightarrow g B

Ch 9 Notes C.ink



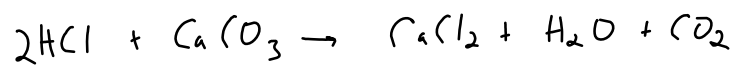
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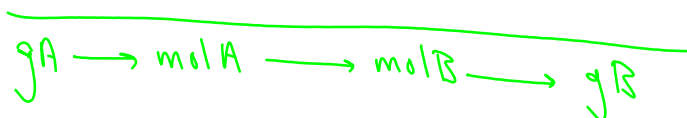
Ch 9 Notes C.ink



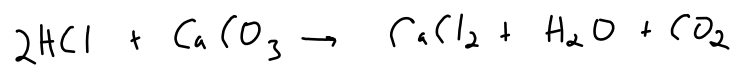
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If 4.78 g of HCl
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$$4.78 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.5 \text{ g HCl}}$$



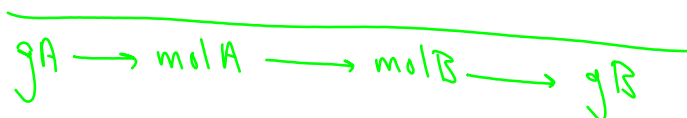
Ch 9 Notes C.ink



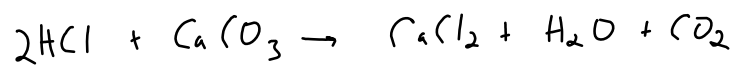
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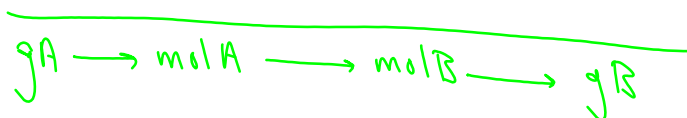
Ch 9 Notes C.ink



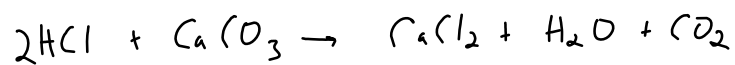
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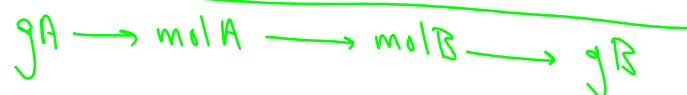
Ch 9 Notes C.ink

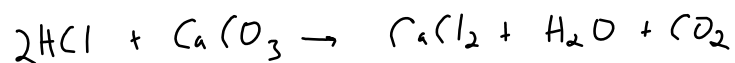


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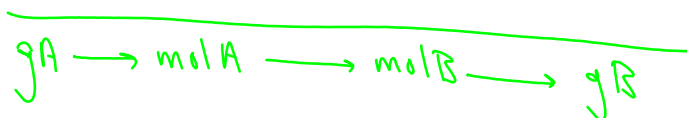




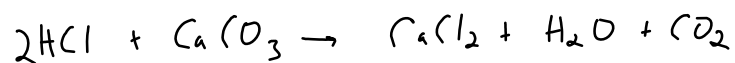
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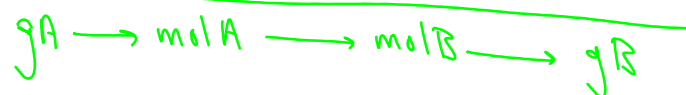
Ch 9 Notes C.ink



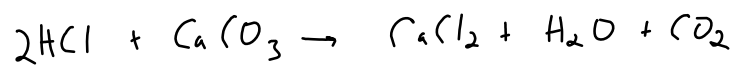
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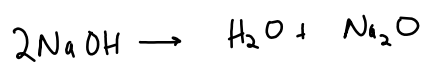
mass-mass stoich

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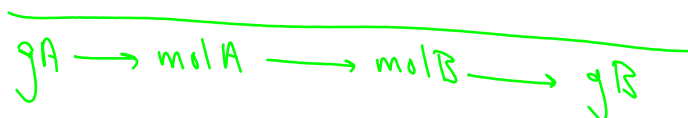
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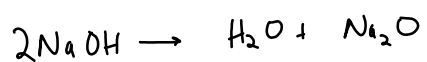
Ch 9 Notes C.ink



How many g of
NaOH were decomposed
when 5.42 g of Na_2O
were produced?

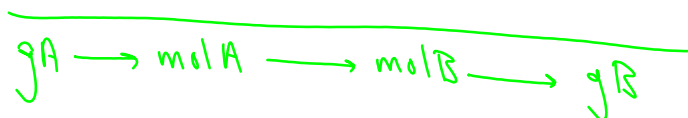


Ch 9 Notes C.ink

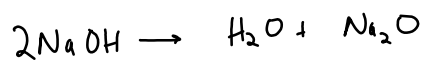


How many g of
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were produced?

$$5.42 \text{ g Na}_2\text{O} \times \frac{1 \text{ mol Na}_2\text{O}}{62 \text{ g Na}_2\text{O}}$$

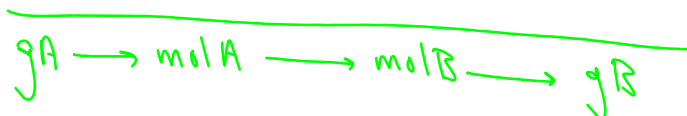


Ch 9 Notes C.ink

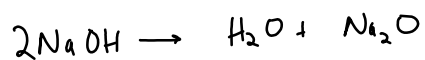


How many g of
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$$5.42 \text{ g Na}_2\text{O} \times \frac{1 \text{ mol Na}_2\text{O}}{62 \text{ g Na}_2\text{O}} \times \frac{2 \text{ mol NaOH}}{1 \text{ mol Na}_2\text{O}}$$



Ch 9 Notes C.ink



How many g of
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$$5.42 \text{ g Na}_2\text{O} \times \frac{1 \text{ mol Na}_2\text{O}}{62 \text{ g Na}_2\text{O}} \times \frac{2 \text{ mol NaOH}}{1 \text{ mol Na}_2\text{O}} \times \frac{40 \text{ g NaOH}}{1 \text{ mol NaOH}} = 7.0 \text{ g NaOH}$$

